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THE BLACKBERRY MITE,
THE CAUSE OF REDBERRY DISEASE
OF THE HIMALAYA BLACKBERRY,
AND ITS CONTROL

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Fig. 1.—Branch of Himalaya blackberries showing a typical case of the “redberry disease” at the time of harvest. Half natural size.

THE BLACKBERRY MITE,¹ THE CAUSE OF REDBERRY DISEASE OF THE HIMALAYA BLACKBERRY, AND ITS CONTROL

By E. O. ESSIG*

Specimens of Himalaya blackberries infected with what is commonly known as the "redberry disease" were first received by the Division of Plant Pathology during the late summer of 1921. A microscopic examination of the fruit by Miss E. H. Smith, Assistant Plant Pathologist in the Experiment Station, disclosed a minute white mite among the drupelets and, as no other pathogenic organism was discovered, the specimens were placed in my care and I began a study of the problem, to ascertain whether or not the mite was in any way connected with the disease. By conducting some simple spraying tests with lime-sulfur and wettable sulfur on selected plots, it was proved that when the mites were killed the redberry conditions soon disappeared. Successive tests and demonstrations every year since 1921 have shown that the mite was directly responsible for the trouble and that it could be cheaply and effectively controlled.

THE HOST PLANT

Observations over a period of four years have so far revealed the mite injurious only to the Himalaya blackberry. Other varieties of blackberries, including the Mammoth, Oregon Evergreen, Lawton, as well as dewberries, loganberries and raspberries, growing in the immediate vicinity of the Himalaya, and often interlacing with it, have been carefully examined without finding the mite. The Mammoth blackberry frequently develops a redberry condition on a very small scale, but this has usually been due to attacks of mealy bugs, thrips, and other insects. So far, no mites have been found in such berries.

NATURE OF THE WORK

The work of this mite is best characterized by the common term "redberry disease," which is applied to the red condition of the fruit

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¹ *Eriophyes* sp. Family *Eriophyidae*.

at harvest time, well shown by the accompanying colored plate (fig. 1). The mites enter the flowers and infest the berries as the drupelets are forming, and remain at the base of the berry and about the core. They feed near the bases of the drupelets, causing abortion in many cases, a retarded and uneven ripening in some, and an abnormal red condition in the great majority of cases (fig. 2). A few berries often remain entirely green or entirely red, while some are to be found with green, red and fully ripened drupelets. This latter condition prevails generally in an infestation of but short duration, and develops into the



Fig. 2.—A large crop of Himalaya blackberries with practically 100 per cent infestation of the blackberry mite and none of the berries turning black at time of harvest. (Photo by Paul S. Williamson.)

characteristic redberry stage in one or two more years. At this stage, the infested berries remain red for a week or so, then dry up or decay, but never ripen in the normal way. The dried berries may remain on the bushes until the following season (fig. 3). In three or four years an infestation may develop to the extent of ruining the entire crop. A number of commercial patches and many backyard plantings have been rendered absolutely worthless by this obscure mite. In order to observe the mites it is necessary to separate the drupelets of the suspected berries and examine them under a good hand lens or preferably under a microscope, for they cannot be seen by the unaided eye.



Fig 3.—Himalaya blackberry infested with the blackberry mite and showing the last season's crop dried and still clinging to the vine on the 18th day of February. (Photo by Paul S. Williamson.)

THE MITE

The mite (fig. 4) responsible for the redberry disease is an unusually small species, averaging but 0.15 mm. in length, and is but one-fifth as wide. The color is translucent white, the form elongated cylindrical, with the anterior region largest and tapering almost to a point at the posterior end. The surface, excepting the fore part, is finely corrugated with seventy-five or eighty fine concentric rings, and supports several long body spines. There are but two pairs of legs, situated anteriorly, which serve to drag the body, the posterior end of which is controlled by means of a sucker which serves as an anchor when needed. The feet terminate in a claw, a plumed hair and a knobbed hair or digitule, as shown in fig. 4.

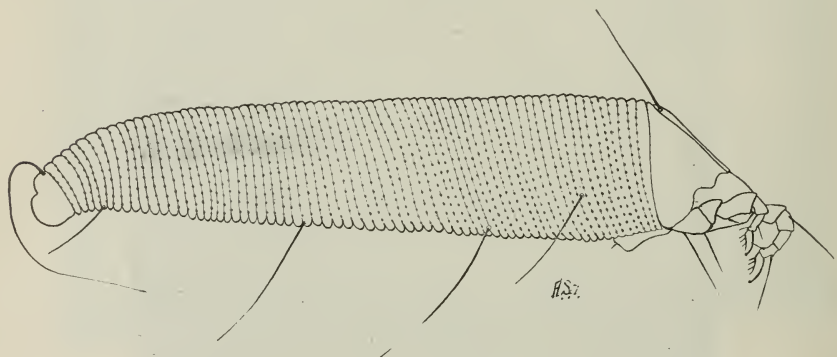


Fig. 4.—The blackberry mite, *Eriophyes* sp., which is the cause of the “red-berry disease” of the Himalaya blackberry. It is so small that it cannot be seen without a magnifying glass. Greatly enlarged. (Drawing by A. S. Hassan.)

Specimens of the mite forwarded to Dr. H. E. Ewing² of the Bureau of Entomology, U. S. Department of Agriculture, were determined as the European species, *Eriophyes gracilis* (Nalepa), which is common on the European raspberry, *Rubus idaeus* Linn., in Europe. Nalepa³ states that it causes a yellow erineum on the tender leaves, but makes no mention of its attacking the fruit. Schlechtendal⁴ describes

² Essig, E. O., and Smith, E. H. Two interesting blister mites. Monthly Bul. California Dept. Agr. 11: 63. 1922.

Essig, E. O. Note on the two blister mites. Ibid. 11: 466. 1922.

³ Nalepa, Alfred. Zoologica 24: 236. 1911.

⁴ von Schlechtendal, D. H. R. Zoologica 24: 414, fig. 15. 1911.

similar work and also gives an illustration of a raspberry shoot showing a marked curling of the leaves, with no mention of injury to the berries. It seems hardly probable that the species attacking the berries of the Himalaya blackberry in California is the same as the one infesting the leaves of the European raspberry in Europe, but as yet the writer has been unable to account for its presence in the state. Further study may reveal the true source of its origin.

The winter is spent in the leaf clusters and buds, where all the protection possible is available. The hibernators consist of mature and immature forms, which remain inactive until the new growth starts in the spring. As the flower buds appear, the mites work their way into the unfolding buds, into the flowers and down among the developing drupelets of the berries, where they feed until the fruit ripens, rots, or dries up on the vines, when all that succeed in making their way to the leaf clusters and buds on the stalks go into hibernating quarters. The small white oval eggs are laid in the berries, and several overlapping broods appear during the summer months.

DISTRIBUTION

The distribution of the blackberry mite in California appears to be coëxtensive with that of the Himalaya blackberry, which occurs chiefly along the coast (fig. 5). Both appear to thrive best in a cool, moist climate and are most abundant in the San Francisco Bay region and the Santa Cruz foothills. It is doubtful if there is a single commercial patch or a backyard vine in the above areas that is not now infested. Infested berries have been received from practically every county along the coast, but serious injury has not yet been recorded in the extreme south or north.

CONTROL⁵

Extensive experiments and field demonstrations have proved that the mite can be effectively controlled by the application of early spring sprays and that infestations and injuries may be completely checked by the use of summer sprays. A series of field demonstrations conducted by Paul S. Williamson, Assistant Farm Advisor of Santa Cruz County, in commercial plantings, gave excellent proof of the value of the sprays recommended for control.

⁵ Essig, E. O. Preventing redberry disease. Orchard and Farm, Los Angeles Examiner. Apr. 15, 1923.



Fig. 5.—Map of California, showing the coastal region best adapted to the culture of the Himalaya blackberry, and which coincides with the distribution of the blackberry mite and the “redberry disease.”

Dormant or Early Spring Sprays (fig. 6).—The most satisfactory results are obtained by the application of dormant or early spring sprays to kill the hibernating forms before they gain entrance into the flowers and berries. These sprays consist of commercial lime-sulfur in strengths of 4 per cent, 6 per cent or 8 per cent, or corresponding strengths of dry lime-sulfur or of soluble sulfur. Apparently the 4 per cent is as satisfactory as the stronger solutions if spraying is well done. The improved, highly refined lubricating oil emulsions are also satisfactory. Applications should be made preferably when the new growth starts in the spring and before the flowers open. Pruning and trellising should precede spraying. Great care should be taken to completely cover the stems and buds when spraying.

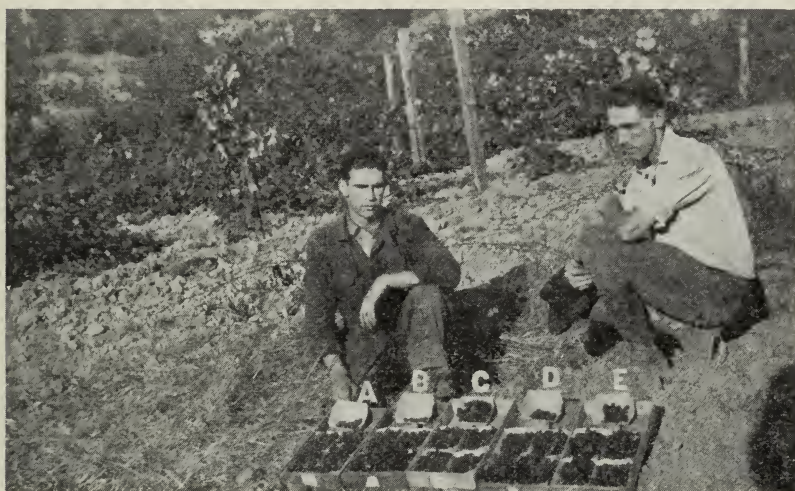


Fig. 6.—Results of spraying demonstrations in the control of the blackberry mite in commercial plantings in Santa Cruz County by the Farm Advisor. Fruit sorted at the time of harvest. **A**, vines sprayed on March 4, 1924, with 4 per cent lime-sulfur; normal berries 484, red berries 16, showing but 3.2 per cent redberry disease when picked on August 4; **B**, vines sprayed on March 4, with 8 per cent lime-sulfur; normal berries 494, red berries 6, showing but 1.2 per cent redberry disease when picked August 4; **C**, check vines not sprayed; normal berries 395, red berries 105, showing 21 per cent redberry disease when picked August 4; **D**, vines sprayed May 4 with 4 per cent lime-sulfur; normal berries 487, red berries 13, showing 2.6 per cent redberry disease; **E**, vines sprayed July 7 with five pounds of wettable sulfur to one hundred gallons of water; normal berries 474, red berries 26, showing 4.2 per cent redberry disease. (Photo by Paul S. Williamson.)

Blossom and Summer Sprays.—Later spring sprays of either 4 per cent lime-sulfur or of wettable sulfur, applied when the vines are in full bloom, are nearly as effective as the dormant sprays, according to the demonstrations conducted by Mr. Williamson in Santa Cruz County. The usual strength of wettable sulfur spray is five pounds of wettable sulfur to one hundred gallons of water. In cases of severe infestations, eight pounds of the wettable sulfur may be used. Summer spraying, if done when the berries are still green, may result in checking the work of the mites and thus allow some of the berries to mature normally. Late fall spraying is often too late to affect the crop of the same year but will destroy many of the mites and thus help to control the pest the next season. Summer or fall spraying, followed by dormant spring sprays, will insure complete protection. To prepare wettable sulfur sprays, mix dry ten pounds of milled sulfur or flowers of sulfur and one-half pound of dry calcium caseinate spreader. Add sufficient water to make a paste. Place in the spray tank and add the remainder of the water to make the proper dilution.

Spraying Insurance.—This is one case where spraying as insurance may be justly advocated because the mite is so generally distributed and control measures are so sure to bring the desired results that the berry grower cannot afford to run the risk of losing even a part of the crop by failing to properly treat the plants in the early spring.

Spray Injury.—So far, no injury to the vines or berries has been noticed from dormant and blossom sprays, even where the concentration of lime-sulfur has been as high as 8 per cent. Summer sprays of wettable sulfur, however, have caused some burning to the leaves and fruit when used stronger than four pounds to one hundred gallons of water. To avoid spray injury, apply only dormant or early spring sprays, or irrigate, if possible, before the application of summer sprays, and do not spray during excessively dry and hot weather.

CONSUMPTION OF INFESTED BERRIES

Infested berries are in no way injurious for human consumption. If they are not edible fresh, because of lack of ripening, they may be safely used for jams and jellies.

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